BRIDGING PARADIGMS: FORMAL AND FUNCTIONAL LINGUISTICS AND THE TEACHING PERSPECTIVE

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Abstract

This contribution focuses on the comprehensive treatment of linguistic theory in a student classroom under particular regard of the formal vs. functional perspective. It focuses on the transparency of both paradigms concerning descriptive and explanatory adequacy and revises the results gained over several decades of work in the respective fields. Both paradigms will be sketched against the background of two relatively new contenders, Cognitive Linguistics (CL), which is largely functionally motivated, and Optimality Theory (OT), which is largely generative-formally motivated. This contribution tries to find common ground between formal and functional linguistics with CL bridging the methodological gap. It thus aims at an integrative approach and introduces a notion of motivational adequacy.

1 Introduction

Linguistic phenomena are motivated by a set of universal initial conditions that are linked to two types of human endowment, the neuro-physiological and the cognitive endowment. Both are related to evolutionary steps and thus to processes mainly from the field of evolutionary biology.

This makes sense for several reasons. The most important is the need for communication. A highly communicative species can be more successful than species who communicate less – thus the genetic traits of the former will be selected. Thus communication itself comes to be regarded as an evolutionary advantage: speakers talk things through when they plan something, mainly they talk to someone about something. This "aboutness" is the basis for the symbolic function of language, it makes humans the "symbolic species" (Deacon 1998).

Further, this observation leads to the assumption that communication is an adaptation to the pressure from the environment, with language representing a highly efficient and successful way of communication. The processes of adaptation itself lead to certain observable phenomena in today's natural language. However, the basic idea that links evolutionary past and the present usage of certain syntactic and morphological forms represents a modern way of thinking about language. Linguistics from both paradigms starts to adopt Neodarwinian ideas in the wake of especially Dawkins (2006) [1976] as evidenced by Hauser, Chomsky and Fitch (2002).

Thus the necessity arises to integrate approaches from theoretical biology, especially from Neodarwinism with linguistic approaches. This does not make sense to everybody in the field, especially linguists who do not know anything about biology and those biologists who do not know anything about linguistic theories. It is – and has been for a long time – possible to study linguistic phenomena under neglect of these motivational causes.

Linguistics itself can be basically subdivided into approaches called reductionist and non-reductionist. It is not at all clear from the beginning where the evolutionary ideas tie in here: In reductionist approaches, large classes of phenomena can be explained with formulae as simple as possible unless leading to contradictions. Non-reductionist approaches elaborate phenomena and find interrelations between them. Their disadvantage is that they are in principle not falsifiable. Falsifiability, however, is a cornerstone of scientific research since the writings of Popper (cf. Popper 1959). The advantage of non-reductionism, however, is that it lends itself to a plausible description of a multitude of phenomena. This means that linguistics can legitimately be found in between both approaches.

It follows naturally that reductionist approaches mostly relate to natural sciences whereas humanities often claim to deal with the non-reducible. The following table summarises the approaches and suggests some examples:

	reductionism	**non-reductionism**
Formal linguistic approaches	formal semantics Generative linguistics Optimality theory (OT)	descriptive Firthian grammar
Functional linguistic approaches	Systemic-functional grammar (SFG)	Cognitive linguistics (CL)

Table 1: Reductionism and non-reductionism in linguistics

2 Formal and functional linguistics and the evolutionary view

2.1 Lessons learned from the biological field

In non-reductionist approaches, the functional approach leads researchers to ask what the function of a linguistic structure is in the same way as a botanist may look at a plant feature and ponder about its purpose. Descriptive linguistics, the study of traditional grammar, involves the listing of constructions (today usually taken from large corpora) and is by definition not a reductionist approach. The

formalisms involved lead to an often contradictory but superficial description of the usage of these constructions in language. They are therefore more important for language teaching.

As a field in the middle, it is interesting to consider functionality within optimality. Looking for function is a reversal of the biological paradigm. What was the main occupation of biologists in the 19th century? In the wake of nomenclatural advances by Linnćus and others, biology was a descriptive science. Thus observing certain species/lexical items involved simply a description how certain species/lexical items behave, e.g. the environment of the individual/its collocation. This does not explain any reasons and therefore attains descriptive rather than explanatory adequacy. The shape of the beaks of finches on the Galápagos Islands inspired Darwin to recognize that this feature is not determined by its relation to other species but determined by its function. Different species show different features because these features have different functions. In that sense evolutionary biology is functional because every organ has its function, otherwise it would be an energetically costly appendage. The linguistic problem of today is that the idea of optimality arises from a reductionist approach but numerous examples show where optimality is functionally relevant.

2.2 Paradigm split in linguistic applications

In direct application the environmental pressure is creative in all examples derived from the fields of anthropological linguistics, the field of eco-linguistics (cf. Mühlhäusler 1996, Fill 2001), modern approaches to pidgin and creole studies that portray them as adaptations to environmental pressures (cf. McWhorter 2001) – in all these the focus is on a functional relevance of forms. The linguistically interesting question is: How can the same explanatory instrument serve to yield explanatory adequacy in both linguistic paradigms. Traditionally, since the split into the Generative paradigm (1960s) and the emergence of a functional paradigm (1970s) there has been almost no communication between these two paradigms. Dissatisfied with the shortcomings of the then dominating paradigm (at least in North America) many well-known linguists jumped ship and went over to the functionalist side, generative grammarians such as Lakoff or Langacker (founder of Cognitive grammar). Today, it has become difficult for functionalist linguists to talk to generative linguists and the other way around. This poses problems for the teaching of linguistics: either follow leading schools or inspire critical thinking about both approaches. This thinking, however, needs support in that both approaches should be taught as complementary, not as opposites. Optimistically, we can try and reconcile certain ideas that are prevalent in those

fields and find evidence for that. Especially grammarians trained in both traditions show surprising insight: Langacker quipped in 1977 (1977: 102):

> I believe we can isolate a number of broad categories of linguistic optimality. Languages will end to change so as to maximize optimality in each of these categories [...]. The tendencies toward these various types of optimality will often conflict with one another (quoted from Haspelmath 1999).

This enlightened comment was written many years before Optimality Theory was founded (1993 by Prince and Smolensky). The common core idea of formal and functional linguistics here is:

a) languages change in order to adapt
b) this change leads to greater optimality (maximize optimality)
c) types of optimality will conflict with one another

Langacker's idea is far-reaching because it presupposes constraints. We cannot have optimality in all features, syntactic and semantic, so there will be constraints. We know further that constraints will conflict with each other; therefore a ranking of constraints is necessary. We thus have evidence that formal and functional linguistics fit together bracketed by the idea of optimality.

3 The benefits of Optimality theory

Optimality Theory (OT) is a natural extension of Generative Theory in the same way as Generative Theory is compatible to formal semantics. The theoretical problem in Generative Theory lies in the way that it proposes a grammar that encompasses all expressions of a language. This means that grammarians need to find a way to separate the expressions that belong to the language from those that do not. This could be imagined as a combination of a generative grammar that overgenerates expressions and a filter that eliminates unwanted expressions (Archangeli & Langedoen 1997: ii). The advantage of OT is that it proposes that the Universal Grammar (UG) from Generative Theory contains sets of violable constraints in which each language has its own ranking of these constraints. Thus the differences in ranking generate systematic variation between languages. The constraints persist on all levels of linguistic description – phonology, morphology, and syntax – and across all these levels. Constraints can be violated in order to satisfy a higher ranked constraint. The optimal candidate has the fewest, lowest number of violations and the only violation is that of the lowest ranking constraint. Therefore, OT proposes an input, an output and a relationship between the two, similar to Generative Theory (Archangeli & Langedoen 1997: 14), cf. *sicken.*

/sikən/	PEAK	ONSET	*COMPLEX	FAITHC	FAITHV	NOCODA
si.kən						*
si.kə.n	*!					
si.kə				*!		
si.kə.ni					*!	

Table 2: Constraint tableau for a simple phonological rule

In any optimality tableau we find a number of constraints so that by calculating them, we find a short formula for certain linguistic form that is either phonological or morphological.

3.1 Rules vs. constraints

In Generative grammar, rules describe the mapping between phonological representation and phonetic form. OT replaced rules with a hierarchy of ranked, violable constraints; however, both have the same goal: the description of linguistic competence. A simple example is the English plural formation: In a proposed mental phonological representation, the basic shape is /-z/ which has different allophones in *cats* /-s/, *dogs* /-z/ and *horses* /-əz/. A constraint is that sequences of obstruents must have the same value for voicing. A way to overcome this constraint is therefore devoicing and/or epenthesis:

phonological representation	**/kæt#z/**	**/dɔg#z/**	**/hɔrs#z/**
epenthesis	-	-	/hɔrs#əz/
devoicing	/kæt#s/	-	-
phonetic form	[k^hæts]	[dɔgz]	[hɔɹsəz]

Table 3: Plural formation in English (adapted from Anderson & Lightfoot 2002: 98)

The English plural formation tableau relies on the input to have the root and the plural morpheme always in voiced form. Several simple constraints help explain that. Cf. the following four constraints (based on Haspelmath 1999):

SAMEVOICE:	Sequences of obstruents within a syllable must agree for voicing
OCP(SIBILANT):	Sequences of sibilants are prohibited within the word
DEPIO:	Insertion of segments is prohibited
IDENTITY(VOICE):	Input and output are identical for voicing

Several of these constraints correspond well with evolutionary principles: In the SAMEVOICE the voicing agreement shows that an unmotivated change in voicing is unnecessarily costly. In DEPIO the insertion of segments is prohibited because something cannot be optimal when we have to bring in new lexical material to supply our linguistic form. This goes against the faithfulness constraint that says that anything that appears in the input has to be the output. To add something like an epenthetic element (e.g. a schwa) to the segment represents an additional effort. It is thus more optimal not to bring it in, but to work with what we have in the input (cf. Table 4).

	SAMEVOICE	OCP(SIBILANT)	DEPIO	IDENTITY(VOICE)
/kæt-z/				
kæt-z	*!			
kæt-əz			*!	
kæt-s				*
/hɔrs-z/				
hɔrs-z	*!			
hɔrs-əz			*	
hɔrs-s		*!		
/dɔg-z/				
dɔg-z				
dɔg-əz			*!	
dɔg-s				*!

Table 4: Constraint tableau for the English plural (adapted from Haspelmath 1999)

This is also the principle of the IDENTITY(VOICE) constraint. Two constraints will be violated when we assume that the underlying consonant from the phonological input representation is voiced. Several constraints are critically violated by the same voice constraints, thus there is no solution like /kætəz/. The schwa is also not inserted in /dɔgz/ which makes *dogs* the most optimal solution: It resembles very closely the input, it follows that input and output are nearly identical here. /dɔg-s/ is ruled out due to the effort of producing a sequence of a voiced velar stop and a voiceless sibilant. If these constraints hold, then there

must be a way to formulate a constraint, so that not only the optimality theoretic approach is satisfied, but also that we explain it in a sort of functional framework. Two sibilants together are difficult to produce, so it will be functionally relevant not to have two sibilants together, which is evidenced by the impossibility of /hɔrsz/. However, this is an evolutionary explanation that is inherently compatible with functional rather than formal linguistics.

4 Towards an integrational account on functionality within OT

4.1 A unification of explanatory adequacy

The focus in this paragraph will be on constraints and their parallel interpretations, i.e. their interpretation in an 'optimality' way and in a functional way. The latter represents a reinterpretation, largely suggested by the insightful paper by Haspelmath (1999). He discusses the MaxLex constraint which says that vowel elision typically does not affect roots and content words. He then ventures two alternative explanations. The Optimality Theory explanation by Casali: "[this] arises from a more general functional motivation, a preference for maintaining phonological material belonging to elements that typically encode greater semantic content" (Casali 1997 as quoted in Haspelmath 1999). What is functional about this? In OT terms, this explanation is very functional, only that it does not get to the core of functionality, which is a sort of motivational adequacy. It is formal within being functional in the sense that less or more semantic content is encoded. When we attempt to maintain phonological material that encodes rather more than less semantic content, then it will contrast with items that have less semantic content. This creates a hierarchy of semantic content from where it seems obvious that greater semantic content is advantageous, thus more optimal and more relevant than words with less semantic content. This can be tested easily by looking at any sentence and leaving out either all the function words (which have less semantic content) or all the content words (which have more of it). It can be shown that when leaving out all the content words (nouns, verbs) it is impossible to extract meaningful sense out of the sentence. This is also supported by data from psycholinguistic research that found evidence for an incremental buildup of meaning (cf. Gorrell 2001: 748). Greater semantic content supports communication, therefore highly packaged content is an adaptation to optimal communication. Further, it is an adaptation not to distort the phonological material belonging to elements with greater semantic content. This is the reason why it has to be maintained.

Haspelmath (1999) considers formal explanations of this type as "vacuous" because they give no causality whatsoever for the advantages that justify the existence of constraints of this type. Instead, his simple reinterpretation of MaxLex is as follows: Preserving phonological material of elements with greater semantic content helps the hearer to identify the most important parts of a discourse. When we destroy the part of semantic information and the items that have greater semantic value, then the listener loses central parts of the communication. This hinders efficient communication. Therefore it is functionally not optimal and thus in OT would violate high-ranking constraints. It is the same explanation that is given for a formal and a functional approach. Explanatory adequacy is identical in both paradigms.

4.2 General constraints revisited

To continue the approach taken in the previous paragraph, any formal expression in language should then be motivated by functional criteria which are evolutionary and subject to change. Cf. the functional interpretation of the SameVoice constraint: Obstruent sequences with different phonation types are difficult to perceive because a voicing contrast is not salient in an obstruent environment. Salient means it does not stick out for the perceiver in an obstruent environment. Consider a sequence where there are two obstruents that differ in voicing: In any phonetic environment the difference between the two segments would never be discriminatory because it cannot be perceived. It is impossible to hear the glottis move from open to close between the two stop sounds. Therefore, the difference between voiceless and voiced segments in an obstruent environment is not salient. The hearer will not hear it. If something is not salient, then there is no need for language to encode it. Language encodes only structures that people can perceive; therefore it violates optimality if these sequences would exist. For general constraints the same explanations apply. For Grimshaw's Stay (Grimshaw 1997): "Do not move", the functional explanation is not that input and output differ: this is rather an effect but it is not an explanation. The explanation is that leaving material in canonical position helps the hearer to identify grammatical relations and reducing its processing costs of the speaker. E.g. placing prepositions before nouns in operator-operand languages leaves the lexical elements *in situ* under influence of Stay: Any movement would increase our processing costs. By moving we find the material in non-canonical positions (without expecting it). This leaves additional processing load in order to decode it. Any unnecessary processing is disadvantageous and hence not optimal. There is a clear evolutionary explanation by way of a psychological explanation. Haspelmath (1999) offers a

similar reinterpretation of Pesetzky's Telegraph constraint which says, "Do not pronounce function words" (ibid.: 191). As demonstrated above, the diminutive value of function words for the message actually favors their neglect. Leaving out function words thus reduces pronunciation costs for the speaker in a way that is "minimally disruptive for understanding by the hearer" (ibid.) and the message remains somehow understandable.

5 Conclusion

To conclude from the evidence presented above: the formal paradigm (in the gestalt of OT) collects evidence in hierarchies of constraints, the functional side adds a plausible evolutionary or cognitive explanation that is a reflection of palaeoanthropological selection mechanisms. This means for teaching linguistics that students should be familiarized with both sides and the modern view on their complementarity.

In a famous quote, Theodosius Dobzhansky remarked that "nothing in biology makes sense except in the light of evolution" (Dobzhansky 1973). As could be shown, language as a highly specified adaptation is part of human biology in which speakers follow heuristics of their primate ancestors. Even the diachronic relationship between earlier and later stages in a language (e.g. abandoning overmarking in Early Modern English which is a costly redundancy) makes sense in the light of evolution. It could not be in any other way.

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